

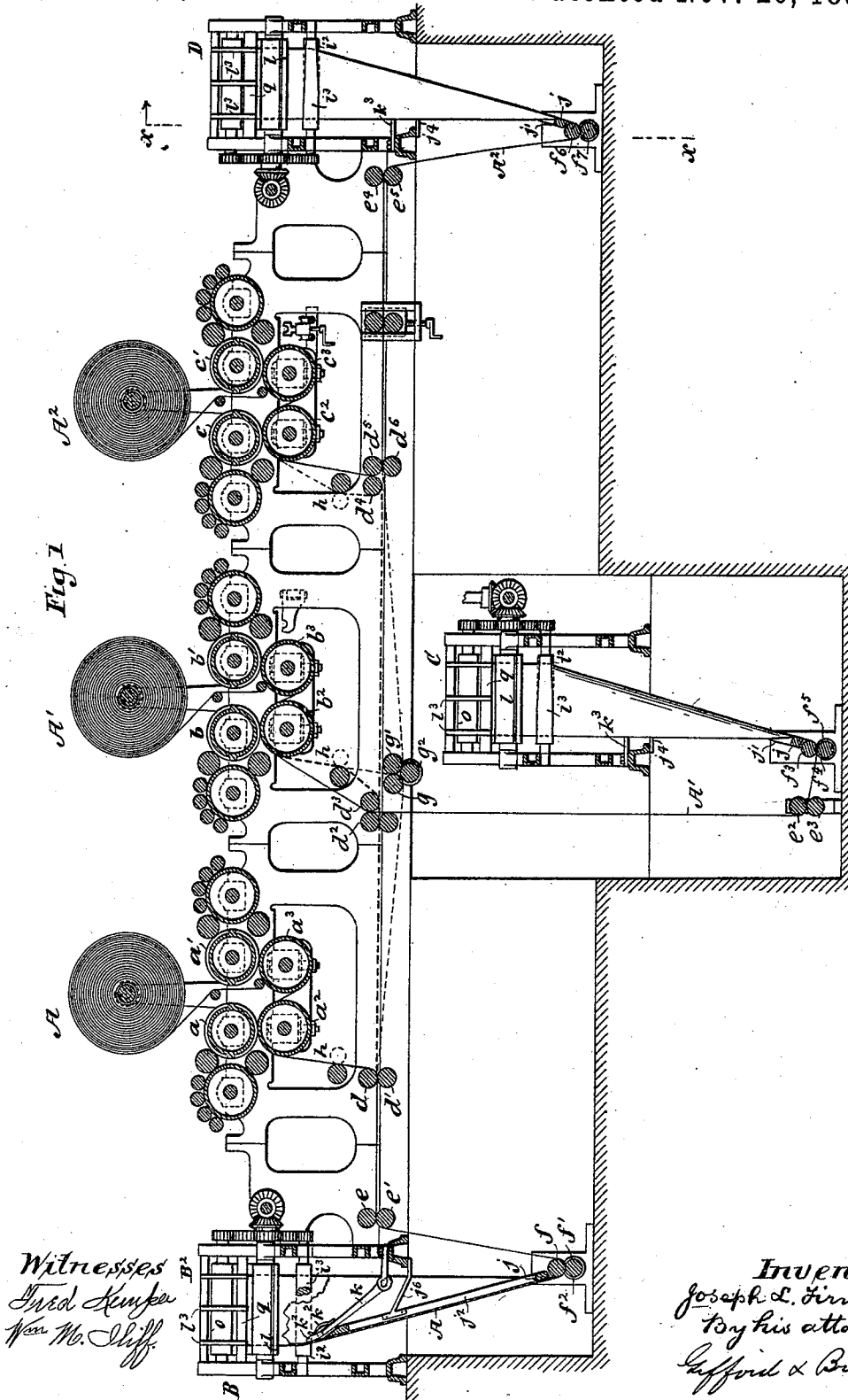
(No Model.)

5 Sheets—Sheet 1.

J. L. FIRM.
PRINTING MACHINE.

No. 529,680.

Patented Nov. 20, 1894.



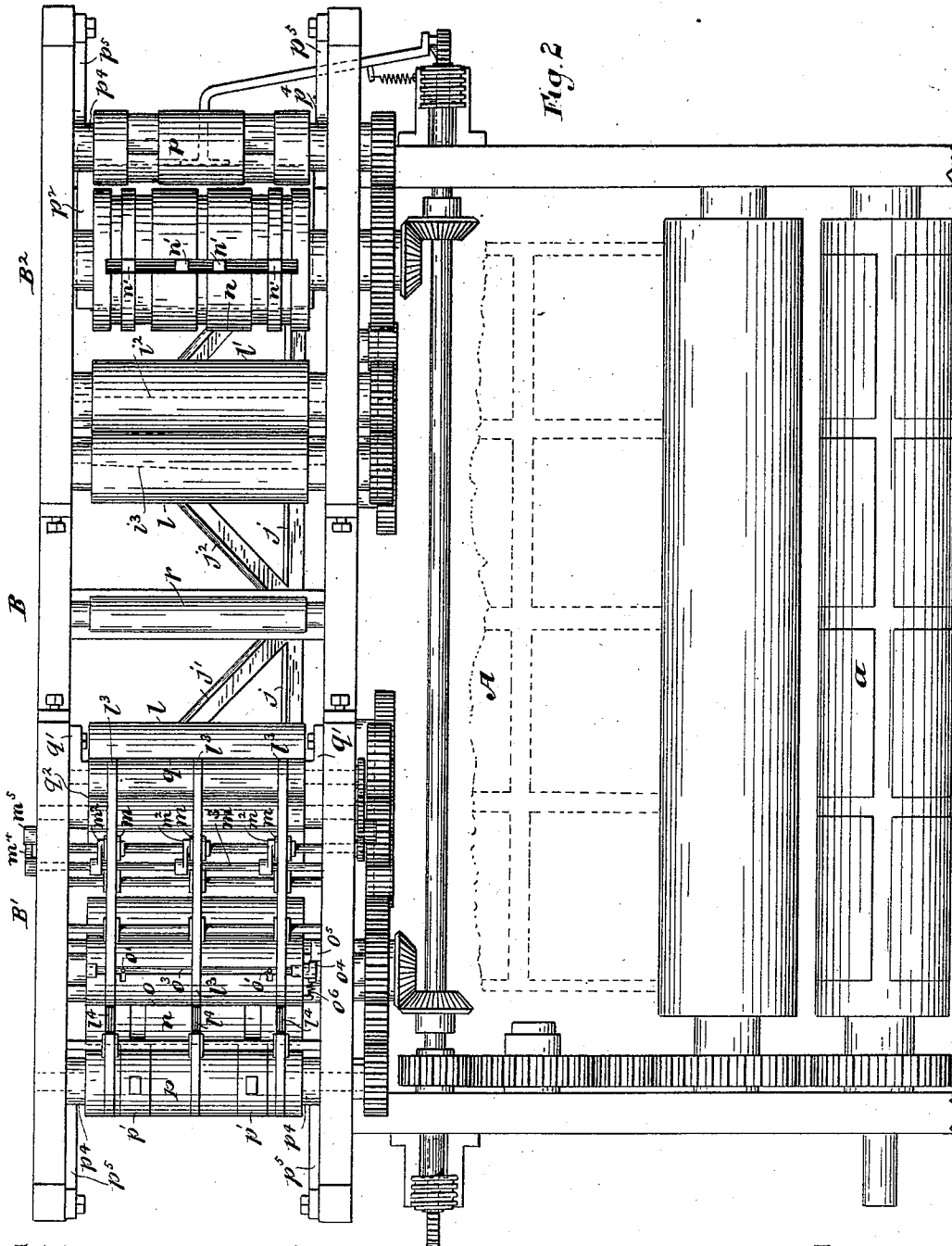
(No Model.)

5 Sheets—Sheet 2.

J. L. FIRM.
PRINTING MACHINE.

No. 529,680.

Patented Nov. 20, 1894.



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Wm. Mc Cliff

Inventor
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By his attorneys
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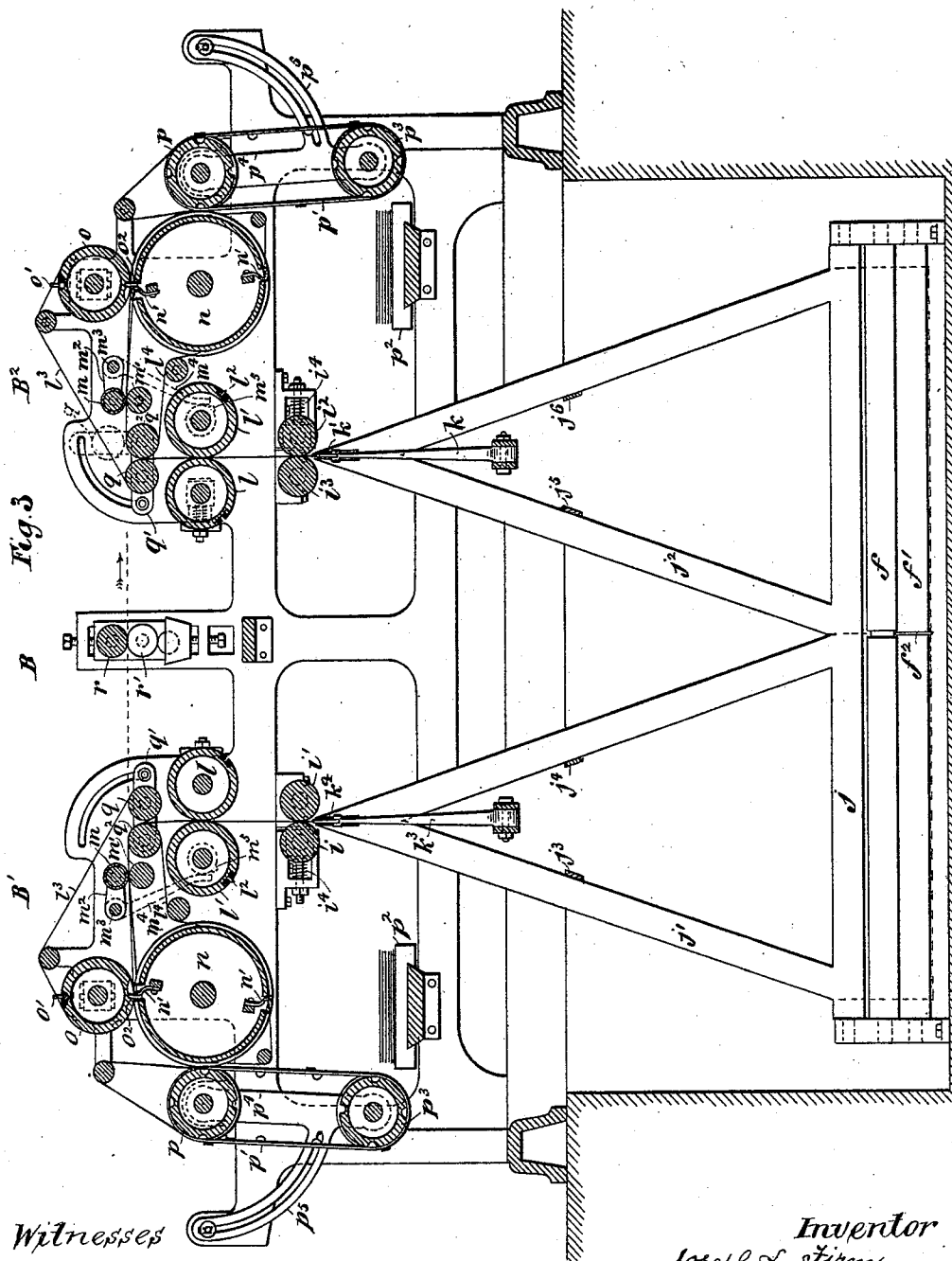
(No Model.)

5 Sheets—Sheet 3.

J. L. FIRM.
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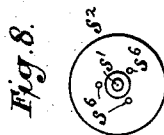
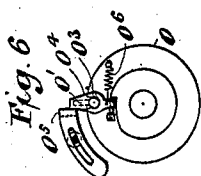
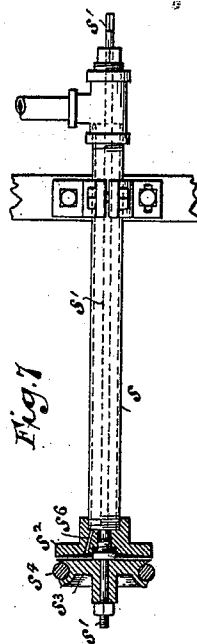
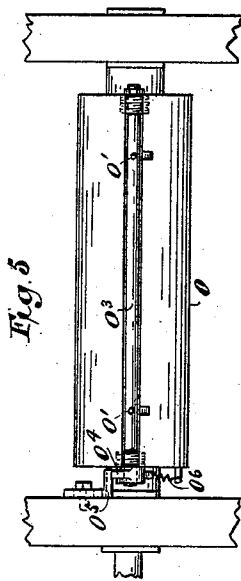
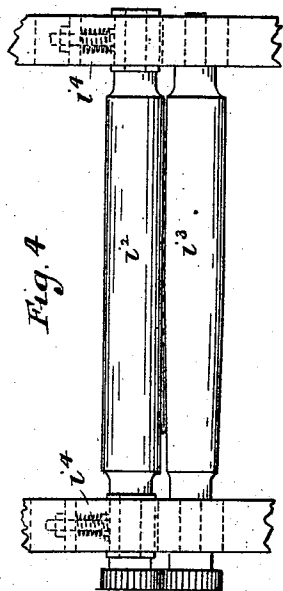
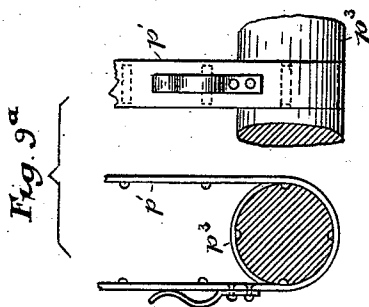
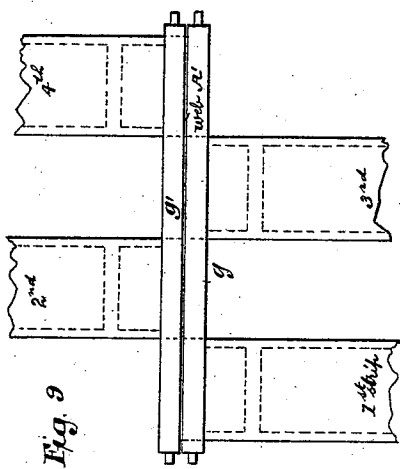
(No Model.)

5 Sheets—Sheet 4.

J. L. FIRM.
PRINTING MACHINE.

No. 529,680.

Patented Nov. 20, 1894.



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J. L. FIRM.
PRINTING MACHINE.

No. 529,680.

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Fig. 10

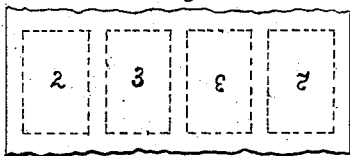


Fig. 11

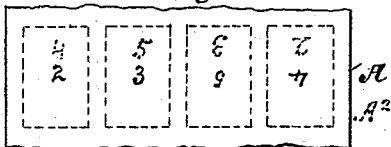


Fig. 12

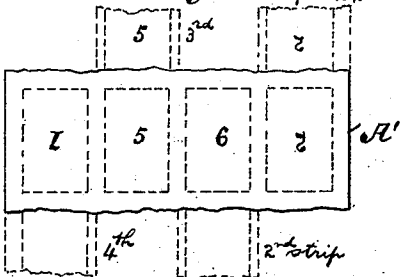


Fig. 13

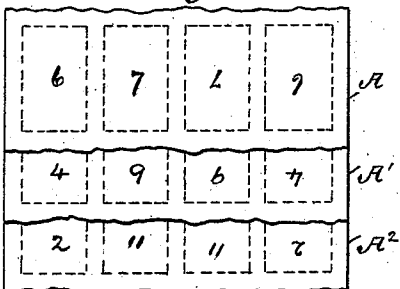


Fig. 14

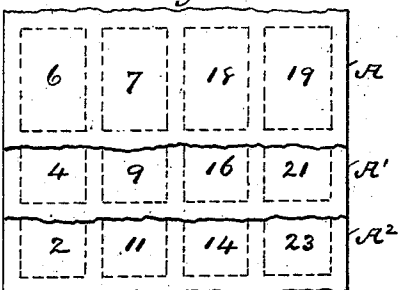


Fig. 15

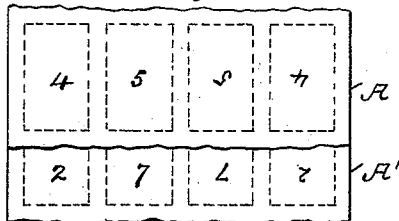


Fig. 16

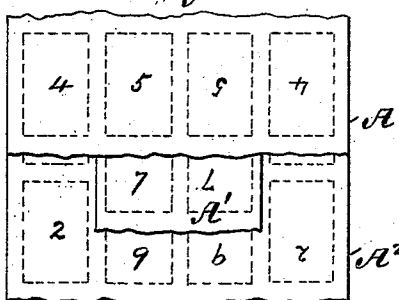


Fig. 17

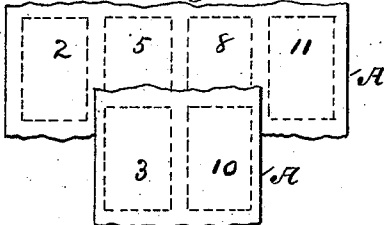


Fig. 18

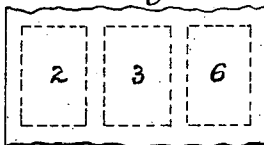


Fig. 19

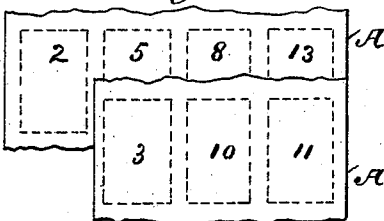
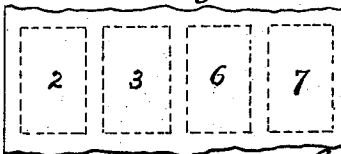


Fig. 20



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UNITED STATES PATENT OFFICE.

JOSEPH L. FIRM, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO THE GOSS
PRINTING PRESS COMPANY, OF CHICAGO, ILLINOIS.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 529,680, dated November 20, 1894.

Application filed November 9, 1889. Renewed September 1, 1893. Serial No. 484,597. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH L. FIRM, of Jersey City, New Jersey, have invented a new and useful Improvement in Printing-Machines, of which the following is a specification.

In the accompanying drawings, Figure 1 is a longitudinal sectional elevation of the whole machine. Fig. 2 is a plan view on a somewhat larger scale of one of the folding mechanisms and a portion of the printing mechanism immediately adjacent thereto. Fig. 3 is a section through the line xx of Fig. 1. Fig. 4 is an enlarged view of the rollers $i^2 i^3$. Figs. 5 and 6 are enlarged views of the roller o and the mechanism immediately connected therewith. Figs. 7 and 8 are enlarged views of the mechanism employed in applying paste. Fig. 9 shows one manner in which the paper leaves the rollers after being split. Fig. 9^a shows a grip finger that may be used on the belt p . Figs. 10 to 20 inclusive illustrate various combinations and arrangements of the pages upon the webs.

This invention relates to improvements on the Letters Patent issued to me September 3, 1889, No. 410,271. In said patent is described a printing machine in which a plurality of webs after being printed upon are split longitudinally and severed transversely between the pages and all conducted to one double folding device located at right angles with the printing machine proper.

In my present machine, I employ three double folding devices and various improvements in the details of construction by which I am enabled to facilitate the work and to increase the capacity of the machine so far as the range of page combination is concerned.

A¹ A² are three webs.
B C and D are three double folders. The two sections of the folder B are designated respectively B' and B². The two sections of the folder C will be referred to respectively as C' and C². The two sections of the folder D will be referred to respectively as D' and D².

Before going into the details of construction the general operation of the machine may be described as follows: When it is desired to produce simultaneously six copies of a newspaper containing four pages, the page forms upon the cylinders $a a'$, $b b'$, $c c'$, are corre-

spondingly arranged so that four pages are printed abreast on each side of each web as indicated in Fig. 10. Each web contains the pages for two newspapers abreast; those for one newspaper being on opposite sides of the central longitudinal line from the other. The course which the webs take after leaving the printing rolls and the impression rolls $a^2 a^3$, $b^2 b^3$, $c^2 c^3$, is indicated in Fig. 1 by the unbroken lines. The web A passes first between the guide rolls $d d'$, $e e'$ and thence to the rolls or guides $f f'$ one of which is provided with a radial knife f^2 adapted for splitting the web centrally. Thence one half of the web passes through the half B² of the folder B and the other half passes through the half B' of the folder B. In the meantime, the web A' passes (as also shown in full lines in Fig. 1) between the guide rollers $d^2 d^3$ and $e^2 e^3$ and the rollers $f^3 f^4$ one of which is provided with a radial knife f^5 for splitting the web centrally. Then one half of this web proceeds through the half C² of the folder C and the other half of the web proceeds through the half C' of the folder C. In the meantime the web A² passes (as also shown in full lines in Fig. 1) between the guide rolls $d^4 d^5$ and $e^4 e^5$ and the rolls $f^6 f^7$, the latter being provided with a radial knife for splitting the web centrally. Thence one half of the web passes through the half D² of the folder D and the other half passes through the half D' of the folder D. Fig. 3 may be taken as an illustration of this; the parts D' and D² corresponding with the parts B' and B² therein, respectively.

When it is desired to make simultaneously four copies of a six page paper, the pages on the webs A and A² are printed four abreast on each side of the web. The arrangement on one side of the web A is shown by the numbers in full lines, Fig. 11, and the arrangement on one side of the web A² is shown by the numbers in dotted lines in the same figure. The pages are printed on the web A' as one side is shown in Fig. 12. Then the webs A and A² proceed to the folders B and D as before. The web A' however, instead of passing to the folder C as before, after being printed, passes to the rollers $g g' g^2$, one of which is provided with three radial knives whereby the web is divided into four parts

each containing a single longitudinal line of pages on each side. Each part or strip leaves the rollers g g' as indicated in Fig. 9; the first and third strips going to the rollers d and d' and the second and fourth strips going to the rollers d^5 and d^6 , as shown by the fine broken lines in Fig. 1. The various parts of the machine are so distanced from each other that when the first and third strips of the web A' pass under the web A , between the rollers d and d' , the pages for the same newspaper will in all cases index with one another. When the whole passes to the folder B the first strip of web A' will proceed to one side with one half of the web A and the third strip of the web A' will proceed to the other side with the other half of the web A . In like manner when the second and fourth strips of the web A' pass under the web A^2 between the rollers d^5 and d^6 , the pages belonging to each newspaper will index with one another; and when the whole has passed to the folder D , the second strip will proceed to one side of the folder with one half of the web A^2 and the fourth strip will proceed to the other side of the folder with the other half of the web A^2 . In all these cases of a six page newspaper if, as shown in the drawings, the strip of the web A' is brought into such relationship with the other web with which it is combined, as that shown in Fig. 1, it occupies a position outside the fold of the other web, and will constitute either the first or the last page of the completed newspaper depending upon which strip it may be.

In order to make two copies simultaneously, of a newspaper containing twelve pages, the three webs are conducted as shown in Fig. 1 in heavy broken lines and as I shall now more particularly describe. The three webs are printed upon as shown in Fig. 13, where each is supposed to be overlapping the other. Then they are conducted around the intermediate guide rolls as shown until they are all brought together so as to index the pages properly one above another between the rollers d and d' and thence conducted to the folder B where each half of the combined webs proceeds to an opposite side of the machine.

When it is desired to make a newspaper containing twenty-four pages the webs are printed as shown in Fig. 14 and then conducted as last described as far as the last folding operation, before which however (as indicated by dotted lines in Fig. 3) instead of passing the two halves of the combined webs to opposite sides of the machine, they are passed to the same side of the machine and receive the last fold in combination. This will be more fully described hereinafter.

In order to make two newspapers of eight pages each, the webs may be conducted as described in reference to a twelve page paper, with the omission however, of one of the webs, and in this case the two remaining webs will be printed as shown in Fig. 15.

In order to make two newspapers of ten pages each, a half web may be employed on one of the three cylinders and the printing be done as shown in Fig. 16. Obviously, a newspaper of twenty pages may be made by combining the two halves of the combined webs in the last folding operation instead of passing them to the opposite sides of the machine as in the case of ten pages.

When it is desired to make a newspaper containing twelve pages and employ but two sets of printing cylinders, a half web A and a full web A' are used and printed as shown on one side in Fig. 17. In this and all the succeeding figures the several portions of the divided webs are passed to the same side of the folding machine (as indicated by dotted lines in Fig. 3) and receive the last fold in combination.

When it is desired to make a newspaper containing six pages and employ but one set of printing cylinders, the web is printed as shown on one side in Fig. 18. In this case only three pages are printed abreast on each side of the web and the two portions of the web after being longitudinally slit between the pages 3 and 6 are combined as described in reference to Fig. 17.

In order to make a newspaper containing fourteen pages, two webs are employed and printed as shown on one side in Fig. 19. The several portions are combined as mentioned in reference to Fig. 17.

When it is desired to make a newspaper containing eight pages and employ but one set of printing cylinders, the web is printed as shown on one side in Fig. 20 and the two portions of the web after division are combined as mentioned in reference to Fig. 17.

Returning now to a more detailed description of the machine, it may be remarked that where the various webs are to be combined as in the case of anything more than a four page paper it will be desirable to apply paste at the margins where the webs are to be folded together and this may be accomplished immediately after the webs are printed as at h by a pasting device of any well known construction.

A description of one folder, B , will suffice for all.

After the web or webs have passed between the rollers or guides f and f' and have been split by the knife f^2 , they encounter a guiding frame interposed between the roller or guide f and each pair of rollers, i i' , i^2 i^3 , respectively. This guiding frame consists of a piece j extending transversely across the whole width of the web and journaled at both ends as shown in Fig. 3. Two V-shaped guides j' j^2 project from this cross piece in an inclined position as shown in Fig. 1 until their apices, respectively, nearly reach the point of contact of each pair of rollers i and i' , i^2 and i^3 , as shown in Fig. 3. Each half of the web as it passes from the roller or guide f to the rollers i i' or i^2 i^3 , as the case may be, is

held distended by the guide j' or j^2 , as the case may be, gradually approaching nearer and nearer to a fold as it advances along the guide. Just as it leaves the extremity of the guide a jointed finger $k k'$, the extreme joint of which is pressed by the spring k^2 , bears against the paper with a yielding pressure accommodating itself to the slightly varying demands of the rollers $i i'$. This finger may operate through a slot cut at the apex of the guide as shown in Fig. 3. The guides themselves may be held in position by the braces $j^3 j^4$, $j^5 j^6$ secured to the frame of the machine as shown in Fig. 1. Since now the two halves of each folder are alike, a further description of one half will suffice for an understanding of both. The rollers i^2 and i^3 are held together by a yielding pressure afforded by a spring i^4 bearing against each of the journals of one of the rollers. These rollers are driven by suitable gearing as shown, and their surfaces instead of being exactly parallel are made to recede from each other toward the end where the fold of the paper is received as shown in Fig. 4. This may be done by making the roller i^3 slightly conical at that end. This construction grips the paper less tightly at the fold than toward the edges and causes the machine to operate much more smoothly and satisfactorily and without injury to the paper. It will be observed that the driven rollers i and i' are arranged at the top of the guide j' so that if any tear should occur in the paper passing through them no clogging can result from the torn part falling onto them as might be the result if they were otherwise disposed.

$l l'$ are rollers provided with a serrated knife l^2 which perforates or partially severs the web on the transverse margins. The web is not, however, torn completely apart until it has passed between the tapes $l^3 l^4$ and the rollers $m m'$. The rollers or retarders m are severally mounted upon the arms m^2 or otherwise connected to the same shaft m^3 . This shaft is journaled in the frame so as to be adapted to rock slightly and is caused to rock at intervals by the arm m^4 actuated by a cam m^5 on the journal of the roll l' . This cam is so constructed that the rolls or retarders m are pressed toward the roll m' once, just after each transverse partially severed margin has passed between them. The effect is that the pressure of the rolls or retarders m upon the portion of the web succeeding the margin, retards the same while the feed of the portions of the web preceding the margin proceeds and the web is consequently torn completely apart on the line of perforations which had been previously produced by the knife l^2 . From this point forward therefore, the portion of the web provided for each newspaper is separated from all other portions. As the forward edge of each newspaper comes between the cylinders n and o it is impaled upon the row of pins o' and the newspaper is carried around the cyl-

inder o outside of the tapes l^3 until the middle of the page is reached, when the tucking projection o^2 tucks the paper into the grasp of the grippers n' which hold onto the fold of paper thus formed and carry it around the cylinder n . In the meantime, the pins o' release the forward edge of the paper and the whole is carried by the grippers n' , fold foremost, between the cylinders n and p . Here it is released by the grippers n' and laid hold of by grippers (a desirable form for which is shown in Fig. 9^a) located upon the tapes p' and delivered by them upon a suitable rest p^2 . The cylinders $p p^3$ by which the tapes p' are carried may be mounted upon a frame p^4 pivoted concentric with the cylinder p and made adjustable at any angle desired by the slotted arm p^5 . In this manner the newspapers may be delivered as may be most convenient.

When it is desired, as in the case of twenty-four pages, to combine both halves of the web, by having the roller q mounted upon a pivoted arm q' , pivoted concentric with the roller q^2 , the roller q may be swung up into the position shown in dotted lines in Fig. 3 and then that half of the web which would otherwise be treated by the folder B' , after being perforated transversely, may be conducted across, as shown by the dotted line Fig. 3, into position on top of the half web passing through the folder B^2 , the parts being so distanced from each other as to cause the pages to properly index. From this point forward then, the complete severing and final folding and delivery of the two halves of the web are done together as already described for one half. By having both rollers q mounted on pivoted arms both halves of the split web may be sent either to the folding mechanism B^2 at the right of Fig. 3 as shown in dotted lines, or to B' at the left, as will be obvious. When both halves of the web go in the direction indicated in dotted lines in Fig. 3 the tape l^3 in the mechanism B' will be omitted and the tape l^3 in the mechanism B^2 will simply be shortened, to correspond with the changed position of roller q . Where the two halves of the web are brought together in this manner, it is desirable that they should be pasted together on the folded margin and to this end the pasting rollers $r r'$ of any suitable well known construction are placed along the path of that half of the web which crosses from B' to B^2 .

In Figs. 5 and 6 is illustrated the mechanism which may be employed for causing the pins o' to release the forward edge of the paper at the proper moment. It consists of a bar o^3 journaled at each end and let into the surface of the cylinder o and provided at one end with a finger o^4 so located as to bear against the stationary stop o^5 at the proper point on the rotation of the cylinder o . This stationary stop o^5 , acting upon the finger o^4 , will oscillate the shaft o^3 so as to incline the pins o' backward until they let go of the for-

ward edge of the paper. A spring o^6 serves to hold the pins upright excepting when operated as just described.

In Figs. 7 and 8 is illustrated a paste applying mechanism which may be usefully employed at points already indicated in this description. It consists of a paste conducting pipe s suitably mounted in the frame of the machine and provided with an interior rod s' projecting from both ends and a disk s^2 , concave on its face, fixed upon one end of the pipe. The second disk s^3 is rotatably mounted upon the projecting end of the rod adjacent to the disk s^2 and the periphery of the disk s^3 is encircled by a rubber tire s^4 . The rod s' is screw-threaded to the disk s^2 so that it can be adjusted longitudinally to regulate the size of the crevice between the disk s^3 and the disk s^2 . s^6 are narrow channels through the disk s^2 connecting the interior of the pipe s with the crevice between the two disks so as to admit paste from the pipe into that space whence it is supplied to the rubber tire s^4 ; the extent of the supply being regulated by the size of the opening between the two disks as adjusted by the rod s' . It has been found that the paste passes to the tire and this is probably due to the fact that the disk carrying the tire revolves and therefore exerts centrifugal force on the paste next its surface while the other disk is stationary.

I have described the form of mechanism which I at present deem best for the embodiment of my invention, but I do not wish to limit myself to the form described.

I claim—

1. In combination, two web printing mechanisms arranged side by side and each adapted to perfect a web containing four pages abreast, a pair of guides below each printing mechanism from which either web may be turned to the right or to the left, two guides f and f^6 located one to the right and the other to the left of said first named guides, a longitudinally splitting knife co-operating with each of said guides f and f^6 , two pairs of guiding frames each pair having their bases adjacent to one of said guides, four pairs of longitudinally folding rollers each pair adjacent to the apex of one of said guiding frames and a transversely severing mechanism arranged in the path of each part of the web as it passes from said longitudinally folding rollers, substantially as described.

2. In combination three web printing mechanisms arranged side by side and each adapted to perfect a web containing four pages abreast, a pair of guides below each printing mechanism from which either web may be turned to the right or to the left, a longitudinally splitting knife co-operating with one of said pairs of guides, two guides f and f^6 located one to the right and the other to the left of said first named guides, a longitudinally splitting knife co-operating with each of said guides f and f^6 , two pairs of guiding frames each pair having their bases adja-

cent to one of said guides, four pairs of longitudinally folding rollers each pair adjacent to the apex of one of said guiding frames and a transversely severing mechanism arranged in the path of each part of the web as it passes from said longitudinally folding rollers, substantially as described.

3. In combination two web printing mechanisms arranged side by side and each adapted to perfect a web containing four pages abreast, a pair of guides below each printing mechanism from which either web may be turned to the right or to the left, two guides f and f^6 located one to the right and the other to the left of said first named guides, a longitudinally splitting knife co-operating with each of said guides f and f^6 , two pairs of guiding frames each pair having their bases adjacent to one of said guides, four pairs of longitudinally folding rollers each pair adjacent to the apex of one of said guiding frames and a transversely severing mechanism arranged in the path of each part of the web as it passes from said longitudinally folding rollers and mechanism whereby that part of the web coming from one of said transversely severing mechanisms may be superposed upon that part coming from another, substantially as described.

4. In combination two web printing mechanisms arranged side by side and each adapted to perfect a web containing four pages abreast, a pair of guides below each printing mechanism from which either web may be turned to the right or to the left, two guides f and f^6 located one to the right and the other to the left of said first named guides, a longitudinally splitting knife with each of said guides f and f^6 , four pairs of longitudinally folding rollers at right angles with said guides f and f^6 , one pair being arranged in the path of every division of the split webs, means for guiding the webs to said rollers and a transversely severing knife arranged in the path of every division of the split webs as it leaves said folding rollers, substantially as described.

5. In combination two longitudinal folding mechanisms each adapted for folding a strip of paper, two transversely cutting knives arranged one in the path of each folded strip, paste applying mechanism arranged in the path of one folded strip, mechanism for superposing the cuts from the folded strips one upon the other and mechanism whereby said cuts are folded together, substantially as described; whereby the two halves of the web may be folded longitudinally, then cut transversely, then supplied with the paste necessary for uniting the two, then the cuts brought together, then folded together, substantially as described.

6. In combination, a transversely perforating knife, the tapes t^3 t^4 whereby the web is, after perforating, received and carried forward, the retarder m , the oscillating lever upon which the same is mounted and the cam

whereby said retarder is brought against the web just after each line of perforations, to tear the web apart, substantially as described.

7. In a paste applying device in combination a paste supply pipe, a disk, means for supporting and holding said disk stationary, a second disk, means for revolubly supporting said second disk face to face with the first disk, the said first disk being provided with a channel to convey the paste from a pipe to a crevice between the disks.

8. In a paste applying device, the combination of a paste supply pipe, two disks connected therewith, a yielding tire, and a channel communicating between the tire and the pipe, substantially as described.

9. In a paste applying device, in combination a paste supply pipe, a disk fixed upon the same, a rod extending longitudinally through said pipe, a second disk revolubly mounted on the same and means of adjustment whereby the size of the crevice between the disks may be varied, substantially as described.

10. In combination, the folding rollers and a guiding frame arranged in the path of the web to the folding roller, said frame being provided with a slot at its apex, and a finger arranged to bear on the paper through said slot at or near the apex, substantially as described.

11. In combination, a web printing mechanism adapted to perfect a web containing four pages abreast, a guide *f* substantially parallel with the cylinders of said printing mechanism, two pairs of longitudinally folding rollers substantially at right angles with guide *f*, one pair being arranged in the path of each division of the split web, means for guiding the web to said folding rollers, transversely cutting mechanism substantially parallel with said folding rollers, guides substantially parallel with said folding rollers whereby one folded strip is brought over the other folded strip and mechanism whereby the cuts are folded together; whereby the web may be split, then each half folded longitudinally, then cut transversely, and brought together, then folded together, while moving substantially parallel with one plane before longitudinal folding and parallel with a plane substantially at right angles therewith after longitudinal folding, substantially as described.

12. A web printing mechanism adapted to perfect a web containing four pages abreast, a guide *f* substantially parallel with the cylinders of said printing mechanism, two pairs of longitudinally folding rollers substantially

at right angles with guide *f*, one pair being arranged in the path of each division of the split web, means for guiding the web to said folding rollers, transversely perforating mechanism substantially parallel with said folding rollers, guides substantially parallel with said folding rollers whereby one folded strip is brought over the other folded strip, retarding mechanism whereby the strips are torn apart on the transverse perforations and mechanisms whereby the cuts are folded together, substantially as described, whereby the two halves of the web may be folded longitudinally, perforated transversely, and brought together and torn apart, then folded together, while moving substantially parallel with one plane before longitudinal folding and parallel with a plane substantially at right angles therewith after longitudinal folding, substantially as described.

13. In combination a web printing mechanism adapted to perfect a web containing a plurality of pages abreast, longitudinally splitting mechanism, a plurality of frames for folding longitudinally, a folding roll at the apex of each frame, guides whereby the paper from one frame is caused to travel in the same direction with and associated with the paper coming from the other frame and mechanism whereby said associated papers are folded inside of each other, substantially as described; whereby the two parts of said web receive their primary fold separately and their final fold inside of each other.

14. In combination, three printing mechanisms each adapted to print a plurality of pages abreast upon a separate web, a plurality of longitudinally splitting knives in the path of the web from the middle printing mechanism and guides whereby the alternate strips from the middle web are associated with opposite end webs, substantially as described.

15. In combination, the folding roller, a guiding frame having an apex arranged in the path of the web to the folding roller, an articulate finger arranged to bear upon the inside of the paper at or near said apex and substantially in the plane of contact between the paper and said guiding frame whereby the paper is pressed by the finger on the line of fold while the line of fold is still traveling substantially in the plane of the guiding frame, substantially as described.

JOSEPH L. FIRM.

Witnesses:

S. O. EDMONDS,
FRED KEMPER.